



## Assessing the Safety Behaviour of the Bus Express Driving Condition from the Passengers' Perspective

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**Abstract:** This paper presents the passengers' perspective towards express bus safety issues based on the driver's behavioural characteristics, providing an important aspect in reducing the accidents in Malaysia. A pilot study with a respondent of 40 people, aged between 16 to 41 years old were conducted in Universiti Kebangsaan Malaysia. The developed questionnaires based on the five-point Likert Scale were implemented to assess the safety perception on express buses, and it has a higher reliability of Cronbach's Alpha score at 0.91. The findings show that more than 45 % of the respondents agreed that dangerous behaviour of express bus drivers were mainly due to the use of mobile during driving (63.33%), tailgating (57.58%) and driving above the given speed limit (48.59%). The reason of this behaviour is insufficient time to stick to running schedules and the shift pattern rotations. In terms of safety precautions, about 77% passengers preferred safety briefing using audio due to its ease in understanding the meaningful instruction. In addition, 97% passengers agreed on the needs of a second driver to ensure a safe journey to their destination. Hence, a proposed mitigated solution such as drivers monitoring is needed by the respective agencies to reduce this careless behaviour that may influence the dangerous driving behaviour.

**Keywords:** Express bus safety; bus driver; bus passenger; bus accident; public transport

### 1. Introduction

Express bus is an important mode of transport as it has a high connection between cities and is cheaper compared to trains and flights. The safety of express bus in Malaysia is a major concern to the public. The Malaysian Institute of Road Safety Research (MIROS) reported that a total of 1855 bus accidents occurred between 2012 and 2015. High profile express bus accidents and casualties affects the public view and confidence to use the transport. Hence, it is important to increase express bus safety and reduce the number of accidents [1]. Express bus safety factors include technical component failures and human errors [2]. For example, safety-critical components such as brakes and tyres are important for bus control [3] besides the psychological and spiritual factors [4]. Previous study showed that bus condition and transport operator's safety records were the most important criteria respondents use in assessing bus safety [5]. The main cause of mechanical failure in bus was identified to be the brake failure, with about 56% of the total mechanical failure [3]. Driver fatigue and driving etiquette were also main factors in express bus accidents [6]. Seat belts play an important role in reducing mortality by preventing passengers from being ejected through the window [7,8], hence the importance of public awareness on safety.

Recent progress has been made to increase the safety of express bus such as the use of GPS and cameras to track driving speeds and driver condition. The speed characteristic using a global positioning system was proposed [9] based on the operating profile in order to develop a continuous speed profile between vehicles. In addition, the assistive Driving Aids (ADA) have also been integrated in the latest express bus models such as blind spot view and brake assist [10]. It is important to understand passengers to improve services and safety [11]. By increasing the safety of express bus, it will encourage the public to shift from private to public transport. Recent progress has been made with the use of 3D-modeling technologies to increase safety [12]. For example, the use of virtual reality and augmented reality to simulate the experience of driving an express bus. The effect of these new technologies to increase express bus safety on the public confidence and perception on express bus safety are not yet clear. Therefore, the objective of this study is to investigate the perception of bus users towards express bus safety and determine the main criteria to increase express bus safety.

The scope of the research is limited to the survey of Universiti Kebangsaan Malaysia (UKM) students to obtain early perceptions on bus driving safety behaviour. The expected outcome of this work is to understand express bus drivers' behavioural characteristics based on the passenger's perspective for an express bus and consequently to aid reduce the number of express bus accidents in Malaysia.

## 2. Assessment Method

This study was done at Universiti Kebangsaan Malaysia (UKM) main campus in Bangi, Selangor. The study focuses on both male and female of UKM Cohort, involving students, staffs and visitors. The data and related information which are needed for this study were collected by conducting a survey with a set of questionnaires which were distributed to respondents. Prior to this study, a pilot study was conducted to ensure the questionnaire used can achieve the main objectives and goals of this study. A pilot study is a technique used to test and confirm the quality of the questionnaires contents. A total of 40 questionnaires were distributed in the pilot study. The respondents were chosen among UKM Cohort due to some reasons that the results of this pilot study are made as a point of reference for the main survey and to obtain early perceptions on bus driving safety behaviour as well as education level related to bus driving. A study suggests that 30 representative participants from the population of interest is a reasonable minimum recommendation for a pilot study where the purpose is preliminary survey or scale development [13]. Fig. 1 presents the process flowchart for this study.

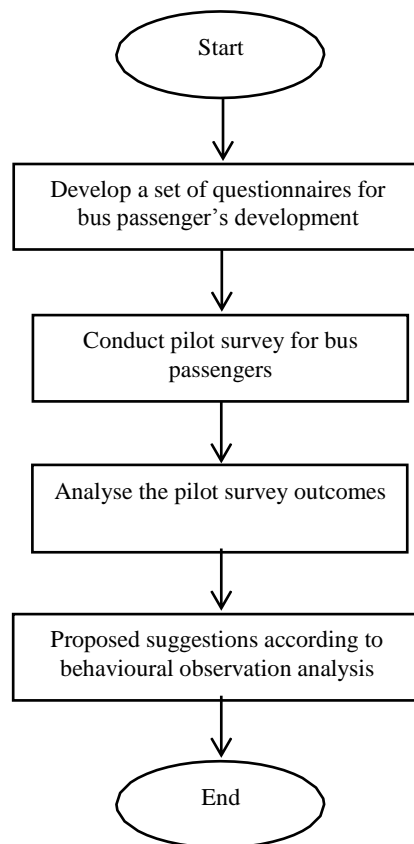
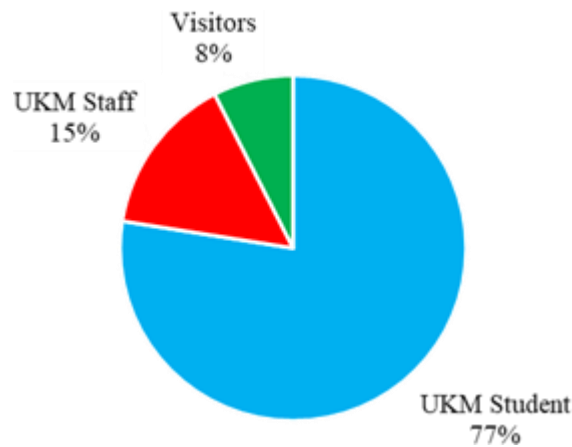


Fig. 1 - The flow of the survey work performed for collecting the relevant perception data

As presented in Fig. 2, 40 of the total respondents were involved to participate in this study, i.e. 31 of the respondents were UKM students, six were the UKM staffs and the remaining respondents were visitors to UKM on the day of this survey.



**Fig. 2 - Respondent classification in questionnaire distribution**

This work takes a descriptive approach and the targeted respondent of this survey was any individual who uses the express bus to get feedback from them about their perception on express bus safety. The choice of survey questionnaires (stated preferences) is used for actual users and potential of an attitude or a choice of consumers when face a choice situation. The questionnaires are divided into three sections and all question types are closed-ended based on a Likert Scale. Based on the literature [10] on the causes related to express bus accidents, these three sections are; Section A- Demographic information of the bus express respondents, Section B-Safety of express bus and Section C- Education on safety of express bus. Sections A define the demographic information of the bus express respondents that consists of the multiple-choice question category. In this category, the respondents were restricted to choose among any of the predefined multiple-choice answer. The elements to be considered for the analysis are respondents experience on ridden an express bus, frequency of respondents riding express buses, gender, household income and the selection criteria of bus companies by respondents. Section B (Safety) and C (Education on Safety) comprises a Likert scale question category based on a five-point Likert Scale to assess the perception on safety and education on safety of express buses, i.e. *strongly disagree (1)*, *disagree (2)*, *satisfactory (3)*, *agree (4)* and *strongly agree*. Table 1 shows the variable components in section B and C of questionnaire. Towards the process of developing the questionnaire, extensive literature [8] that determine the contributing factors of users' perception towards express bus services are considered.

**Table 1 - Variable components in section B and C**

Construct	
SECTION B: SAFETY	
Sudden braking	Cutting off vehicles at double line
Cutting lanes dangerously	Overtaking other vehicles
Use of mobile while driving	Using emergency lanes
Tailgating	Jumping traffic lights
Cutting queue	Driving over speed limit
SECTION C: EDUCATION ON SAFETY	
Travel briefing described through audio	
Travel briefing described through video	
Safety line that can be contacted during emergency	
Need of a second bus driver	

A five-point Likert scale for each question is to be chosen by respondents when answering the questionnaire. If a respondent is uncertain for any questions when he or she chooses a response, for example, the choices then should be partially agreed, probably or do not know. In addition, the statement might be vague and imprecise, that may create confusion, leading to the omission of the scale of three (3). The category for agree (scale 4, 5) and disagree (scale 1, 2) is

combined in order to determine for a mean score, and it can be used for avoiding to focus on the individual items. Analysis of reliability and validity for questionnaire were conducted based on the Rasch analysis using the designated WINSTEPS software package. Based on Rasch measurement model, the reliability acceptable value range of Alpha Cronbach's ( ) is between 0.9 to 1.0, whereas this showed that the level of reliability was excellent. Table 2 shows the interpretation of Alpha Cronbach's score for reliability [14]. When the value of alpha Cronbach  $< 0.5$ , it represents the item as unacceptable. The alpha value of  $0.5 - 0.6$  represents the item as questionable while  $0.7 - 0.8$  represents the item as acceptable. Besides that,  $0.8 - 0.9$  represent that the item is good and acceptable. Lastly, condition of item is excellent is represented by  $0.9 - 1.00$ . The frequency analysis of this study is used based on the frequency of selection and percentage of the agreed statement.

**Table 2 - Interpretation of Cronbach' Alpha Score (Devellis, 2012)**

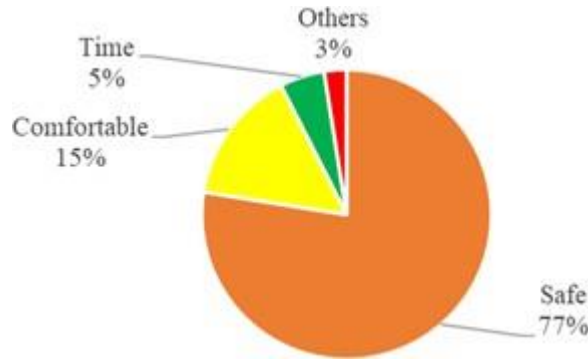
<i>Score of Cronbach's Alpha</i>	<i>Reliability</i>
$0.9 \leq \alpha < 1.0$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

### 3. Results and Discussion

As shown in Table 3, the demographic information obtained from the questionnaires filled by the respondents themselves included frequency of riding express bus, gender, age group, status, education level, employment, income and household income. Bus users' perception towards the express bus services safety are evaluated. It is due to the previously mentioned assumptions towards the safety of express bus services are true. There are four criteria when choosing express bus services; safety, comfortable, time available and others. Passengers perceptions are developed from their travelling experiences using express busses. The findings indicate that the assumptions are true, where 77% of the respondents chose the safety criteria when using express bus services, as shown in Fig. 3.

**Table 3 - Demographic information of 40 respondents involved in the survey**

	Frequency (n)	Percent (%)
Frequency of Riding Express Bus		
Once	20	50
2 – 3 months	14	35
Every month	4	10
Every week	2	5
Gender		
Male	16	40
Female	24	60
Status		
Single	27	67.5
Married	13	32.5
Household Income		
Less than RM 1000	3	7.5
RM 1000 – 2000	14	35
RM 2001 – 3000	9	22.5
More than RM 3001	14	35



**Fig. 3 - Criteria selection of choosing express bus services**

The interpretation of Cronbach’s Alpha ( $\alpha$ ) score for reliability for section B and C are shown in Table 4 and 5, respectively. For section B, the Cronbach’s Alpha ( $\alpha$ ) score for reliability is 0.913 which shows the level of reliability is excellent. However, for section C, the Cronbach’s Alpha ( $\alpha$ ) score for reliability is 0.150 which is unacceptable based on Bond and Fox’s interpretation as shown in Table 2.

**Table 4 - Reliability Statistics for Section B**

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	Number of Items
0.913	0.914	10

**Table 5 - Reliability Statistics for Section C**

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	Number of Items
0.150	0.188	4

The safety criteria obtained from the pilot test was based on passengers’ perception of express bus safety and causes of accidents. According to percentage from the survey, these highlighted factors for dangerous behaviours of express bus drivers were categorised into three aspects; highly dangerous behaviour (above 45 % of the result agree) - the use of mobile while driving, tailgating and driving over the given speed limit; medium dangerous behaviour- changing lanes dangerously, cutting queues and overtaking of vehicles; and less dangerous behaviour (less than 15 % of the survey agree) - jumping of traffic lights and the use of emergency lanes. This is illustrated from Fig. 4 based on the clustered percentage of x-x high, y-y medium and z-z low. The study explains the polarisation towards risky behaviour as a result of insufficient time to stick to running schedules. It has been reported that the bus drivers on-the-job precipitated stress-strain relationship (human side) of shift pattern rotations which leads towards an increase in crash risk safety, customer-focused service and company operating regulations [15]. It is directly related to arrival to destination faster, which includes tailgating of other vehicles and driving at high speed. Hence, the lack of guaranteed rest breaks combined with inflexible time scheduling causes use of mobile during driving, tailgating and driving over speed limit should be addressed by the companies and governing bodies.

Fig. 5 shows the learning techniques preferred by the passengers and their awareness regarding express bus safety. Based on the findings, majority of the respondents preferred the safety briefing performed through audio (77.42%) as compared to video means (64.52%). It can be explained by the ease and practicability of using audio instructions in buses. Furthermore, 83.33% of the respondents indicated that they are aware about the safety help line to be contacted during emergency, while a high number of respondents agreed on the need for a second bus driver (97.44%) to ensure a safe journey to their destination, this is in line with previous studies [10]. These results show that the express bus passengers’ awareness level on safety is considerably high. However, more initiatives for education on express bus safety are recommended to further improve these percentages. For example, more information on the safety help line should be disseminated to the public so that the percentage of respondents that do not know about the safety help line (16.67%) can be ultimately reduced. These findings based on different category questions, are important for the development of education modules to increase safety awareness among bus drivers and the public and will help to reduce express bus accidents.

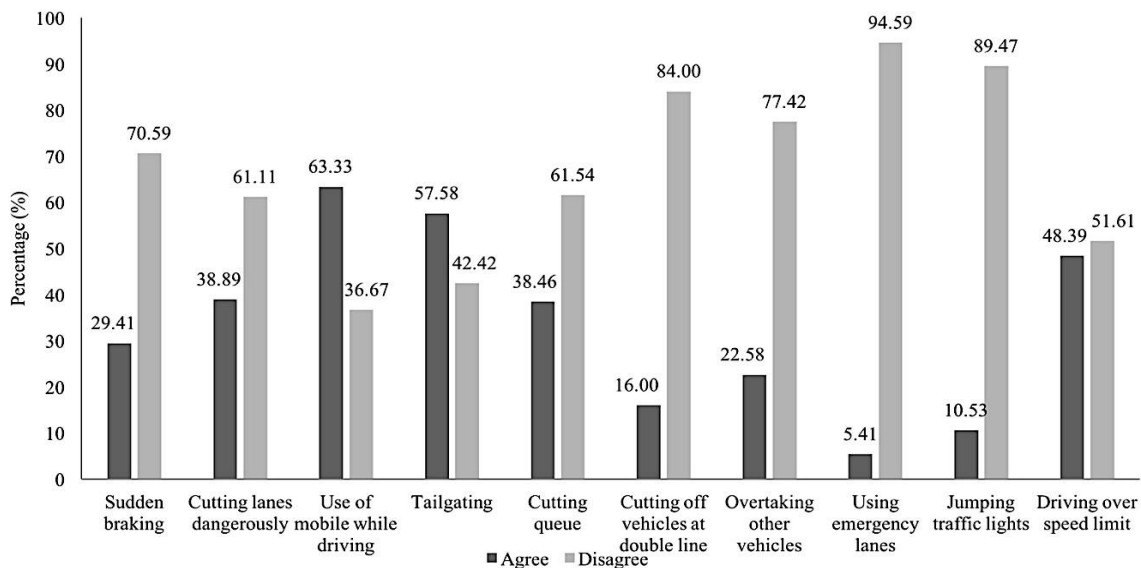


Fig. 4 - Dangerous behaviours exhibited by express bus drivers

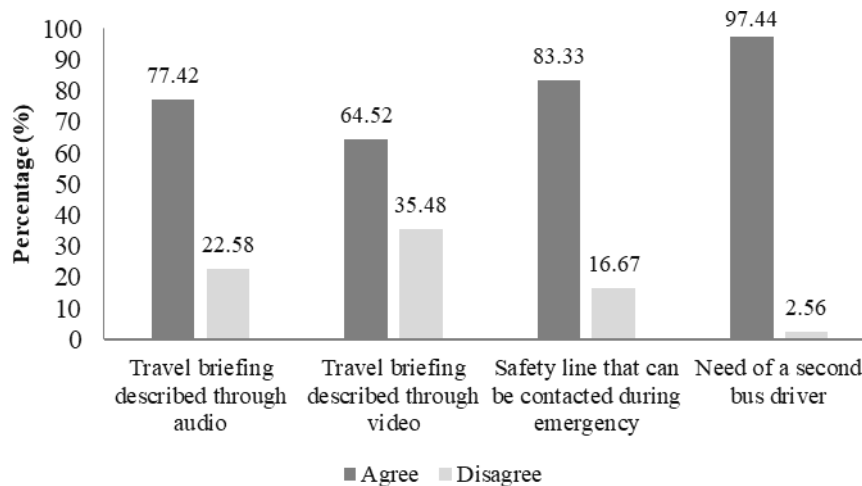


Fig. 5 - Respondents' perception towards learning and awareness on express bus safety

#### 4. Conclusion

Road accidents with fatal and non-fatal casualties involving express buses has become an alarming issue in Malaysia with an increasing number of accidents involving these vehicles recently. The aim of this study was to survey safety issues in terms of the driver's behavioural characteristics based on the passenger's perspective for an express bus. A total of 10 questions were surveyed on the safety perspective mainly focusing characteristics (driver) on the use mobile phone while driving, tailgating, driving over the given speed limit, cutting lanes dangerously, cutting queues, sudden braking, overtaking other vehicles, cutting off vehicle at double line, jumping traffic lights and lastly is using emergency lanes. Results from the passenger's feedback showed that using mobile phone while driving and tailgating have the most direct influence on accident risk. From the safety feedback, the passengers preferred the safety briefing to be address through audio with a visible help line to ensure a safe journey to their destination. Hence, it is recommended that regulatory authority policy on bus safety programme is necessary to ensure the drivers monitoring is necessary as it could forewarn drivers of their risky behaviour.

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